Title: A comparative genomic analysis of the alkalitolerant soil bacterium Bacillus lehensis G1

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Abstract: Bacillus lehensis G1 is a Gram-positive, moderately alkalitolerant bacterium isolated from soil samples. B. lehensis produces cyclodextrin glucanotransferase (CGTase), an enzyme that has enabled the extensive use of cyclodextrin in foodstuffs, chemicals, and pharmaceuticals. The genome sequence of B. lehensis G1 consists of a single circular 3.99 Mb chromosome containing 4017 protein-coding sequences (CDSs), of which 2818 (70.15%) have assigned biological roles, 936 (23.30%) have conserved domains with unknown functions, and 263 (6.55%) have no match with any protein database. Bacillus clausii KSM-K16 was established as the closest relative to B. lehensis G1 based on gene content similarity and 16S rRNA phylogenetic analysis. A total of 2820 proteins from B. lehensis G1 were found to have orthologues in B. clausii, including sodium-proton antiporters, transport proteins, and proteins involved in ATP synthesis. A comparative analysis of these proteins and those in B. clausii and other alkaliphilic Bacillus species was carried out to investigate their contributions towards the alkalitolerance of the microorganism. The similarities and differences in alkalitolerance-related genes among alkalitolerant/alkaliphilic Bacillus species highlight the complex mechanism of pH homeostasis. The B. lehensis G1 genome was also mined for proteins and enzymes with potential viability for industrial and commercial purposes.